CLAIMS

1. A magnetic sensor comprising:

an antiferromagnetic layer;

a first ferromagnetic layer disposed over the antiferromagnetic layer, the first ferromagnetic layer having a magnetization that is pinned by the antiferromagnetic layer;

a second ferromagnetic layer disposed over the first ferromagnetic layer, the second ferromagnetic layer having a magnetization that rotates due to an applied magnetic field;

a third ferromagnetic layer disposed adjacent to an end of the second ferromagnetic layer, the third ferromagnetic layer having a primarily in-plane magnetization providing a magnetic field to stabilize the end of the second ferromagnetic layer;

an amorphous, metallic, nonmagnetic underlayer disposed adjacent to the antiferromagnetic layer; and

a crystalline seed layer disposed between the underlayer and the third ferromagnetic layer, the seed layer having a crystalline structure that promotes the in-plane magnetization of the third ferromagnetic layer.

2. The sensor of claim 1, wherein the underlayer isolates the third ferromagnetic layer from the crystalline structure of the antiferromagnetic layer.

3. The sensor of claim 1, wherein the underlayer includes gallium or tantalum.

4. The sensor of claim 1, wherein the underlayer includes elements X and Y, wherein X is selected from the group consisting of nickel, cobalt, iron, copper or aluminum, and Y is selected from the group consisting of niobium, phosphorous, zirconium, hafnium, tantalum, gallium, terbium, bismuth or dysprosium.

5. The sensor of claim 1, wherein the underlayer includes nickel-niobium.

6. The sensor of claim 1, wherein the seed layer includes chromium.

7. The sensor of claim 1, wherein the seed layer is a chromium alloy, and includes an element selected from the group consisting of titanium, vanadium, molybdenum, manganese or tungsten.

8. The sensor of claim 1, wherein the seed layer has a body-centered cubic (bcc) crystalline structure.

9. The sensor of claim 1, wherein the seed layer has a B2 crystalline structure.

10. The sensor of claim 1, wherein the seed layer is made of a tungsten alloy, and includes an element selected from the group consisting of titanium, vanadium, molybdenum or chromium.

11. The sensor of claim 1, wherein the seed layer includes tungsten.

12. The sensor of claim 1, wherein the seed layer includes an atomic concentration of chromium that is between fifty percent and ninety-five percent.

13. The sensor of claim 1, wherein the seed layer has a crystalline structure that is approximately lattice matched with that of the third ferromagnetic layer.

14. The sensor of claim 1, wherein the seed layer includes nickel-aluminum.

15. The sensor of claim 1, wherein the antiferromagnetic layer includes manganese.

16. The sensor of claim 1, wherein the third ferromagnetic layer includes cobalt.

17. The sensor of claim 1, wherein the antiferromagnetic layer extends more than twice as far as the free layer in a track width direction.

18. A magnetic sensor comprising:

an antiferromagnetic layer having a crystalline structure;

a pinned ferromagnetic layer disposed over the antiferromagnetic layer;

a free ferromagnetic layer disposed over the pinned ferromagnetic layer, the free ferromagnetic layer having a magnetization that rotates due to an applied magnetic field;

a pair of magnetically hard bias layers disposed adjacent to opposite ends of the free ferromagnetic layer, the bias layers having a primarily in-plane magnetization providing a magnetic field to stabilize the ends of the free ferromagnetic layer;

a pair of amorphous, metallic, nonmagnetic underlayers disposed adjacent to the antiferromagnetic layer to isolate the crystalline structure of the antiferromagnetic layer; and

a pair of crystalline seed layers, each of the seed layers disposed between one of the underlayers and one of the bias layers to promote the in-plane magnetization of the bias layers.

19. The sensor of claim 18, wherein the underlayers include nickel-niobium.

20. The sensor of claim 18, wherein the underlayers include gallium or tantalum.

21. The sensor of claim 18, wherein the underlayer includes elements X and Y, wherein X is selected from the group consisting of nickel, cobalt, iron, copper or aluminum, and Y is selected from the group consisting of niobium, phosphorous, zirconium, hafnium, tantalum, gallium, terbium, bismuth or dysprosium.

22. The sensor of claim 18, wherein the seed layer includes chromium.

23. The sensor of claim 18, wherein the seed layers are made of a chromium alloy, and include an element selected from the group consisting of titanium, vanadium, molybdenum, manganese or tungsten.

24. The sensor of claim 18, wherein the seed layers are made of a tungsten alloy, and include an element selected from the group consisting of titanium, vanadium, molybdenum or chromium.

25. The sensor of claim 18, wherein the seed layers include tungsten.

26. The sensor of claim 18, wherein the seed layers include a body-centered-cubic (bcc) crystalline structure.

27. The sensor of claim 18, wherein the seed layers include a B2 crystalline structure.

28. The sensor of claim 18, wherein the seed layers include an atomic concentration of chromium that is between fifty percent and ninety-five percent.

29. The sensor of claim 18, wherein the seed layers have a crystalline structure that is approximately lattice matched with that of the bias layers.

30. The sensor of claim 18, wherein the seed layer includes nickel-aluminum.

31. The sensor of claim 18, wherein the antiferromagnetic layer includes manganese.

32. The sensor of claim 18, wherein the bias layers include cobalt.

33. The sensor of claim 18, wherein the antiferromagnetic layer extends more than twice as far as the free layer in a track width direction.

34. A magnetic sensor comprising:

an antiferromagnetic layer having a crystalline structure;

a pinned ferromagnetic layer disposed over the antiferromagnetic layer;

a free ferromagnetic layer disposed over the pinned ferromagnetic layer, the free ferromagnetic layer having a magnetization that rotates due to an applied magnetic field;

a pair of amorphous, metallic, nonmagnetic underlayers disposed adjacent to the antiferromagnetic layer to isolate the crystalline structure of the antiferromagnetic layer;

a pair of crystalline seed layers, each of the seed layers disposed over one of the underlayers; and

a pair of magnetically hard bias layers disposed adjacent to opposite ends of the free ferromagnetic layer, each of the bias layers grown on one of the seed layers to have a primarily in-plane magnetization providing a magnetic field to stabilize the ends of the free ferromagnetic layer.

35. The sensor of claim 34, wherein the underlayers include nickel-niobium.

36. The sensor of claim 34, wherein the underlayers include gallium or tantalum.

37. The sensor of claim 34, wherein the underlayer includes elements X and Y, wherein X is selected from the group consisting of nickel, cobalt, iron, copper or aluminum, and Y is selected from the group consisting of niobium, phosphorous, zirconium, hafnium, tantalum, gallium, terbium, bismuth or dysprosium.

38. The sensor of claim 34, wherein the seed layers are made of a chromium alloy, and include an element selected from the group consisting of titanium, vanadium, molybdenum, manganese or tungsten.

39. The sensor of claim 34, wherein the seed layers are made of a tungsten.

40. The sensor of claim 34, wherein the seed layers are made of a tungsten alloy, and include an element selected from the group consisting of titanium, vanadium, molybdenum or chromium.

41. The sensor of claim 34, wherein the seed layers include a body-centered-cubic (bcc) crystalline structure.

42. The sensor of claim 34, wherein the seed layers include a B2 crystalline structure.

43. The sensor of claim 34, wherein the seed layers include an atomic concentration of chromium that is between fifty percent and ninety-five percent.

44. The sensor of claim 34, wherein the seed layers have a crystalline structure that is not lattice matched with the that of the antiferromagnetic layer.

45. The sensor of claim 34, wherein the seed layer includes nickel-aluminum.

46. The sensor of claim 34, wherein the antiferromagnetic layer includes manganese.

47. The sensor of claim 34, wherein the bias layers include cobalt.

48. The sensor of claim 34, wherein the antiferromagnetic layer extends more than twice as far as the free layer in a track width direction.